Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2019; 8(2): 982-985
Received: 26-01-2019
Accepted: 27-02-2019

Amardeep Kour
Punjab Agricultural University, Regional Station, Bathinda, Punjab, India

Navjot Gupta
Punjab Agricultural University, Regional Station, Bathinda, Punjab, India

SK Brar
Punjab Agricultural University, Regional Station, Bathinda, Punjab, India

Correspondence
Amardeep Kour
Punjab Agricultural University, Regional Station, Bathinda, Punjab, India

Integrated weed management practices in guava nursery

Amardeep Kour, Navjot Gupta and SK Brar

Abstract
Weed management is a major bottleneck in guava nurseries as the weeds hinder the healthy seedling production. No doubt the herbicide is easy and handy tool for weed management but the excessive use of herbicides have well documented environmental issues. Thus alternate weed management practices are the need of hour for better management of weeds in fruit nurseries. Study was conducted at Punjab Agricultural University, Regional Research Station, Bathinda during 2016 and 2017, to assess the efficacy of different weed management methods on weed control and growth of guava seedlings in nursery. The treatments were Pendemethlin@1.5 l/acre as pre emergence weedicide, paddy straw mulch, black polythene mulch, white polythene mulch, maintenance of weed free seedling through hand weeding. Plots with no weed control practices were kept as control so as to compare the efficacy of different treatments. The results revealed a significant effect of different treatments on grassy as well as broad-leaf weeds in the nursery. Black polythene mulch effectively controlled the weeds and improved seedling survival percentage (95.15%) compared to control recording minimum survival of seedlings (80.7 %).White polythene was poor performer (83.1%) as compared to other treatments due to the heavy weed growth under the mulch and low durability of these sheets resulting in tearing of polythene sheets. Pendemethlin as a pre emergence weedicide @1.5 l/ acre was also effective in reducing the weed incidence but resurgence of weeds resulted in significantly higher weed biomass compared to other treatments. Use of black polythene mulch resulted in low weed density (1.1 m^2) compared to other treatments. The black polythene sheet mulch proved to be effective tool for management of weeds in guava nursery.

Keywords: guava nursery, weeds, *Cyperus rotundus*, *Parthenium*, mulch

Introduction
(*Psidium guajava* L.) Is considered to be one of the exquisite, nutritionally valuable and remunerative crops. Besides its high nutritional value, it bears heavy crop every year and gives good economic returns (Singh *et al*., 2000) [17]. This has prompted several farmers to take up guava orcharding on a commercial scale. Weed management is one of the serious problems faced by nurseryman in guava nursery. For guava plants production, seeds of guava rootstock is sown in the month of August on the raised seed beds and transplanted after six months. The budding of transplanted guava seedlings rootstock is done during the month of May and June. These budded plants are ready to plant in field in the month of September. The period from transplanting to field plantation is most crucial for production of healthy plants which coincides with the growth of a variety of weeds in the guava nursery. Competition among the weeds and guava seedlings for moisture and nutrition decreased the percentage of seedlings attaining buddable diameter and thickness resulting in poor growth of the rootstock. The infestation of weeds results in the poor growth of the rootstock thus budding success is reduced due to delayed budding. Weed management in the nurseries can be done by mechanical, manual, mulching, chemical, and biological methods (Wagner *et al*., 2006; McCarthy *et al*., 2011) [19, 10]. Mechanical weeding harms the young plants while manual weeding is very costly, laborious, time consuming and expensive method owing to scarcity of labor, particularly during the peak periods of labour demand. Moreover, hand weeding is not efficient in as the roots of young seedlings get disturbed along with weeds and the plant dies subsequently. The use of herbicides for weed control in nurseries proved to be effective and feasible method however, mishandling this technology can create residual contents of herbicides, cropping limitations, contamination of underground water and development of genetically resistant weeds (Verdu and Mas, 2007) [18]. Different types of mulches as black polythene, white polythene, paddy straw and other crop residues are effective for weed control as well as moisture conservation. (Bond and Grundy, 2001 [2], Merwin *et al*., 1995) [12].

Organic mulches reported to be beneficial for plant growth and fruit yield and quality in addition to weed suppression (Childers *et al*. 1995) [4]. There was a substantial reduction of weed growth with organic mulches in avocado and citrus over a period of four year (Faber *et al*. 2001) [6]. Transparent or white mulch and green covering had slight effect on weeds, while, the coloured mulches such as brown, black, blue ordouble colored films reduce the weed emergence (Bond and Grundy 2001) [2]. Abouziena *et al*. (2008) [1] obtained the greatest control (94-100%) of weeds occurred with the plastic mulch (200 or 150 µm) and three mulch layers of rice straw .Beneficial effects of black polythene mulch for weed control in different crops have also been reported (Mamkagh, 2009 and Halemani *et al*., 2009) [9,7]. So the present study was undertaken to evaluate the efficacy of different weed management practices on weed control and growth of guava seedlings under nursery conditions.

Materials and Methods

The experiment was laid out at PAU, Regional Research Station, Bathinda located at 30° 11' N latitude and 75° 00' E longitudes at an elevation of 201m above mean sea level. The climate of the experimental area is sub-tropical to tropical with dry season from late September to early June and wet from July to September. The area receives annual rainfall of 400 mm. The soil of experimental site was sandy loam, medium in available N (270 kg/ha), P (16 kg/ha), K (220 kg/ha), medium in organic carbon content (0.65%) and slightly alkaline in reaction with pH 8.0. The six month guava seedlings were transplanted on the beds of 1.5 x1.5 m during the month of February 2016 and February 2017.Six treatments were T_1Weedy check (Control), T_2 (Pendemethlin @1.5 l/acre as pre emergence), T_3 (Paddy Straw), T_4 (Black Polythene), T_5 (White Polythene), and T_6 (Weed free).The pre-emergence herbicide pendimethalin @1.5 lt/ acre was sprayed on the beds with a knapsack sprayer before transplanting, paddy straw mulch of 6 cm thickness, black polythene of mulch 200 µm, white polythene of mulch of 200 µm and weed free check by hand hoeing done at weekly intervals. The paddy straw mulch of 6 cm thickh ness was spread under and between the rows of guava seedlings whereas the plants were planted in the holes made in the black polyethylene and white polythene mulch sheets. The polythene mulch was than pressed carefully and buried under the soil at the edges of the raised bud for maximum efficiency. The weed control efficiency was calculated. Data were collected on survival percentage plant height (cm), stem girth (cm), number of leaves, and dry weight of weeds well as weed density at 4, 8 and 12 weeks after treatment application were recorded The experiment was carried out in randomized block design and replicated thrice. The data was pooled as an average of 2016 and 2017. The least significant difference (LSD) was calculated by multiplying standard error with‘t’ value (P=0.05) at error degree of freedom to compare the means of the treatments. Analysis of variance (ANOVA) and the test of mean comparison according to critical difference (CD) were applied. Significance level was accepted at $p \leq 0.05$. The data of 3 replications was analyzed statistically by randomized block design using CPCS1 software as a statistical analysis tool.

Results and Discussion

Weed spectrum

The experimental site was infested with diverse weed flora comprising of grasses, broad-leaf weeds and sedges (Table 1).

Table 1: Weed diversity in the guava seedling nursery

Grasses	Broad-leaf weeds (BLW)
Cynodon dactylon	*Cannabis sativa*
Sorghum halepense	*Parthenium hysterophorus*
Eleusine indica	*Trianthema portulacastrum*
Eragrostis tenella	*Solanum nigrum*
Cenchrus catharticus	*Cleome viscose*
Digitaria sanguinalis	*Ipomoea pestigridis*
Commelina benghalensis	*Boerhaavia diffusa*
Echinochloa colonum	*Digera arvensis*
Dactyloctenium aegyptium	*Physalis minima*
Eragrostis pilosa	*Amaranthus viridis*
Acrachne racemosa	*Euphorbia hirta*
Sedges	
Euphorbia microphylla	
Cyperus rotundus Phyllanthus niruri	

Plant survival

The highest percentage of plant survival (95.2%) was recorded in black polythene mulch (T4), followed by paddy straw mulch (T4) (93.6 %). Weedy check showed significantly lowest plant population at harvest, which was due to more weed competition (Fig 1).The weed free plots resulted in continuous disturbance of root zone due to manual interventions, which in turn caused low survival (91.6 %) of seedlings compared to black polythene mulch and paddy straw mulch .Earlier studies also attribute disturbance of root zone in manual weeding to low survival of seedlings (Kumar and Singh 2013) [8]. The poor durability of white polythene caused frequent wear and tear resulting in heavy weed growth and least seedling survival (83.1%) under this mulch. The chemical weed control with pre-emergence weedicide, pendimethalin resulted in significant reduction in weeds but later the weeds resulted higher weed incidence and biomass compared to black polythene and paddy straw mulch. Mulching suppresses the weed growth and conserves soil moisture resulting in highest seedling survival percentage. Black polythene mulch also contributed to improved plant height after 40 and 80 days (Fig 1-B). Black polythene mulch provides effective weed control and moisture conservation, which leads to better growth and increased number of leaflets (Ramakrishna *et al*., 2006; Diaz-Perez *et al*., 2008) [13, 5]. The highest plant height (30.4cm) was recorded with black polythene sheet and this was statistically at par with manual weeding treatment (29.5 cm). Increased plant height in mulching treatments was due to reduced competition of plants with weeds (Abouziena *et al*., 2008) [1]. On contrary the poor plant height in white polythene mulch was due to degradation of soil structure (Rehman *et al*., 2012) [14], nutrient loss resulting from high volatilization and reduced organic matter (Merwin and Stiles, 1994) [11], and higher weed competition with young guava plants (Abouziena *et al*., 2008) [1]. Seedling girth is of the most important parameter for performing budding in the nursery plants. The seedling girth was significantly highest (1.4cm) in weed free check and this was

at par with black polyethylene mulch (Fig 1-C). The lowest seedling girth (1.0 cm) was recorded in control followed by white polythene sheet (1.1 cm).Mulches have been reported to conserve moisture, which may be responsible for the improved root growth (Faber *et al*, 2001) [6]. Thus the improved root growth facilitates absorption of nutrients and moisture in order to produce higher color diameter or seedling girth of seedlings. Lowe girth seedling has been reported in seedlings under control and white polythene mulch due to destruction of soil structure and loss of nutrient and moisture (Salton and Mielniczuk, 1995) [15], which in turn, produced underdeveloped roots and caused hindrance in moisture and nutrients uptake. The ground management systems studies have shown substantially different effects on soil chemical, biological, and physical properties as well as differential effects on root-zone microbial communities and tree root development (Yao *et al*., 2005) [20]. The number of leaves per plant which are indicative of vegetative growth of the seedling revealed that the maximum no. of leaves per plant (8.5/plant) were recorded in black polythene sheet mulch followed by weed free check (8.0 /plant), and paddy straw mulch (6.8/plant) (Fig 1-D). Lower no. of leaves per plant under control (5.5) and white polythene mulch (5.0) was due to degradation of soil structure, higher competition for nutrients, moisture and space among weeds and guava seedlings. Our findings are in line with the findings of Boora *et al*., 2013 [3].

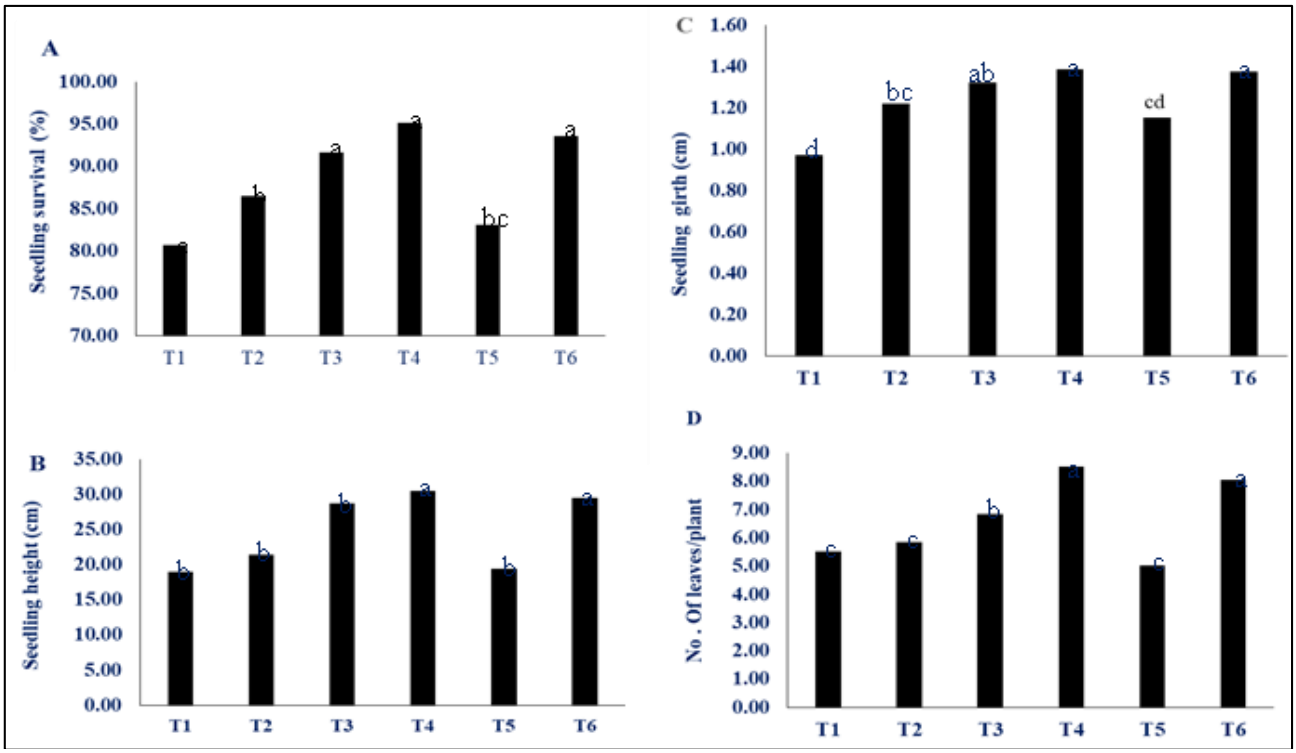
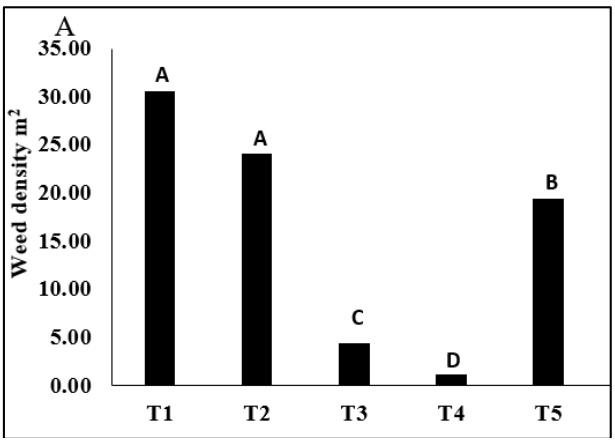


Fig 1(A-D): Effect of different weed management practices on growth of guava seedlings under nursery conditions. The bar values with same alphabets are statistically at par with each other analyzed using Randomized Block Design

Weed population (m^2): All the weed control treatments proved effective in significantly reducing the number of the weeds as compared to the weedy check .Both black polythene mulch and Paddy straw mulch were superior to other treatments for controlling weeds. Black polythene mulch was quite effective in reducing the population of broad leaved weeds, which could be attributed to poor light conditions and physical suppression of the weeds. Similar findings were also reported by Ramakrishna *et al*. (2006) [13] and Diaz-Perez *et al*. (2008) [5]. There were no weeds in weed free treatment (T_6) due to frequent removal of weeds. Least numb weeds ($0.7m^2$) were observed in treatment T_4 *i.e.* Black polythene sheets, followed by paddy straw mulch ($4.4m^2$). The maximum weed count ($30.6m^2$) was noted in UN weeded control (T_1). Polythene mulch on surface of soil creates a barrier for the growth of most of the weeds which results in their very low population. Patel *et al* 2010 also reported black polythene mulch reduced the total weed population ascompared to other treatments at all the stages of observation in case of Damask Rosa nursery. Shirgure *et al.* (2013) [16] also achieved better soil-moisture conservation and weed reduction with black polyethylene mulch and grass mulching in drip irrigated Nagpur mandarin.



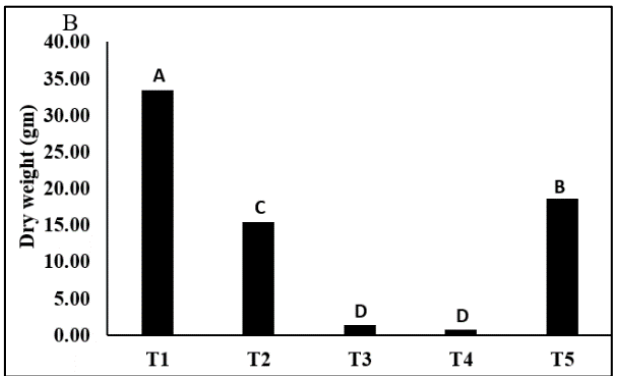


Fig 2 (A-B): Effect of different weed management practices on weed density and weed dry weight. The bar values with same alphabets are statistically at par with each other analyzed using Randomized Block Design

Dry weight of weeds (g)

The dry weight of weeds was found significant under different weed management treatments. Dry weight of weeds was recorded comparatively minimum in treated plots as compared to un weeded control (33.5 gm).Black polythene (T4) ranked first with minimum dry weight (0.7 gm) of weeds, followed by Paddy straw mulch (1.4gm). Our results are in tune with the study of Kumar and Singh 2013 [8].

The improvement in the vigor of seedling measured in terms of plant height, diameter and number of leaves in the treated plots may be due to less weed population. Nutrients and water which are generally used by the weeds were made available to guava seedling for their excellent growth. It was evident that use of black polythene mulch is beneficial in all respects for controlling the weeds, enhanced performance of guava cuttings.

References

1. Abouziena HF, Hafez OM, El-Metwally IM, Sharma SD, Singh M. Comparison of weed suppression and mandarin fruit yield and quality obtained with organic mulches, synthetic mulches, cultivation, and glyphosate Hort Science. 2008; 3:795-799.
2. Bond W, Grundy AC. Non-chemical weed management in organic farming systems. Weed Res. 2001; 41:383-405.
3. Boora RS, Dhaliwal HS, Singh J, Bons HK, Arora NK. Studies on weed management in guava (*Psidium guajava*) nursery under north-western subtropical Irrigated zone of India. Annals of Hort. 2014; 7:1-5.
4. Childers NF, Morris JR, Sibbett GS. Modern Fruit Science. Gainesville, FL Horticultural Publications, 1995, 248.
5. Diaz-Perez JC, Phatak SC, Ruberson J, Silvoy J, Morse R. Utilization of mulches increase yield and improved weed control in no-till organic broccoli. (In) Proceedings of the 30th Southern Conservation Agricultural Systems Conference, July, Tifton, Georgia, 2008, 29-31.
6. Faber BA, Downer AJ, Menge JA. Differential effects of mulch on citrus and avocado. Acta Horticulturae. 2001; 557:303-308.
7. Halemani HL, Hugar AY, Aladakatti YR, Nandagavi RA. Studies on the effect of polythene mulching on cotton growth, yield components and seed cotton yield. Karnataka Journal of Agricultural Science. 2009; 22:280-283.
8. Kumar, Singh. Integrated weed management in damask rose (*Rosa damascena*) nursery Indian Journal of Agronomy. 2013; 58(3):416-420.
9. Mamkagh AMA. Effect of tillage time and plastic mulch on growth and yield of okra (*Abelmoschus esculentus*) growth under rainfed conditions. International Journal of Agriculture and Biology. 2009; 11:453-457.
10. McCarthy N, Bentsen NS, Willoughby I, Balandier P. The state of forest vegetation management in Europe in the 21st century. Eur J for Res. 2011; 130:7-16.
11. Merwin IA, Stiles WC. Orchard ground cover management impacts on soil physical properties. J Am Soc Hortic Sci. 1994; 119:216-22.
12. Merwin I, Rosenberger D, Engle C, Rist D, Fargione M. Comparing mulches, herbicides, and cultivation as orchard groundcover management systems. Horticulture Technology. 1995; 5:151-158.
13. Ramakrishna A, Tam HM, Wani SP, Long TD. Effect of mulch on soil temperature, moisture, weeds infestation and yield of groundnut in northern Vietnam. Field Crops Research. 2006; 95:115-25.
14. Rahman, Ghulam Nabi, Ijaz Ali, Tauseef Tahir, Mukhtar Ahmed. Growth and yield of Kinnow (*Citrus reticulata* Blanco) and soil physical properties as affected by orchard floor management practices in Punjab, Pakistan: Soil Environ. 2012; 31(2):163-170.
15. Salton JC, Mielniczuk J. Relations between systems preparation, temperature and humidity of a Podzolic Dark Red Eldorado do Sul (RS). Rev Bras Ci Solo. 1995; 19:313-9.
16. Shirgure PS. Effect of different mulches on soil moisture conservation, weed reduction, growth and yield of drip irrigated Nagpur mandarin (*Citrus reticulata*). Indian J Agric Sci. 2003; 73:148-52.
17. Singh G, Singh AK, Verma A. Economic evaluation of crop regulation treatments in guava (*Psidium guajava* L.), Indian J agric. Sci. 2000; 70:226-30.
18. Verdu AM, Mas MT. Mulching as an alternative technique for weed management in mandarin orchard tree rows. Agronomy Sustainable Development. 2007; 27:367-375.
19. Wagner RG, Little KM, Richardson B, McNabb K. The role of vegetation management for enhancing productivity of the world‟s forests. Forestry. 2006; 79:57-79.
20. Yao S, IA Merwin, BW George, AS George TE. Thiess. Orchard floor management practices that maintain vegetative or biomass groundcover stimulate soil microbial activity and alter soil microbial community composition. Plant and Soil. 2005; 271:377-389.